THE CLIMATE OF GREAT BRITAIN

SOMERSET AND AVON

Climatological Memorandum 138

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The front cover shows a view of England and Wales from satellite Tiros N taken at 1518 GMT on Wednesday 2 April 1980 – photograph by courtesy of the Department of Electrical Engineering and Electronics, University of Dundee.

An anticyclone was situated to the south-west of the British Isles and a showery north-westerly airstream covered Britain. The alignment of the clouds with the surface wind is clearly seen. Somerset and Avon had about 9 hours of sunshine with a few rain showers, mainly in the afternoon, and maximum temperatures around 13 ^{o}C.

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INTRODUCTION

This memorandum is one of a series which will cover the whole of Great Britain and seeks to present the main features of the climate of the area in a form suitable for use in schools and by members of the general public.

There is an Introduction to the series (Climatological Memorandum 113) which explains how the various weather elements are measured and defines some of the more common terms.

Industrial and commercial interests who are concerned with meteorological information for planning and design will probably require more complex analyses of the available data, and details of the services offered by the Meteorological Office to meet those needs are given on page 16.

CONTENTS

The Area	2
Temperature	3
Humidity	6
Sunshine	7
Rainfall	8
Snow	10
Thunder and Hail	11
Cloud	12
Visibility	13
Wind	13
Weather extremes	15
Comparison with other areas of the United Kingdom	16
Climatological Services available from the Meteorological Office	16
Weather Centres and Public Service Offices	17

Met O 3 (Advisory Services)
December 1988

THE AREA

This memorandum describes the main features of the climate of Somerset and Avon. The area borders the Severn Estuary and Bristol Channel and contains a varied topography. In the west is Exmoor which reaches its highest point at Dunkery Beacon, 521 metres. To the east of Exmoor are the Quantock Hills and south of Bristol the Mendip Hills. The porous nature of the limestone rocks of the Mendips has lead to a lack of surface streams with most drainage underground. Extensive subterranean caverns have been formed, especially near Cheddar, and at Wookey Hole the River Axe emerges from a large cave.

The main area of low ground, known as the Somerset Levels, lies between the Quantock and Mendip Hills. This is an area, similar to the Fens, which lies just above sea level and in the past was subject to flooding by the River Severn which has a tidal range of up to 15 metres. Along the coastal strip there are wide beaches with a number of holiday resorts such as Weston-Super-Mare.

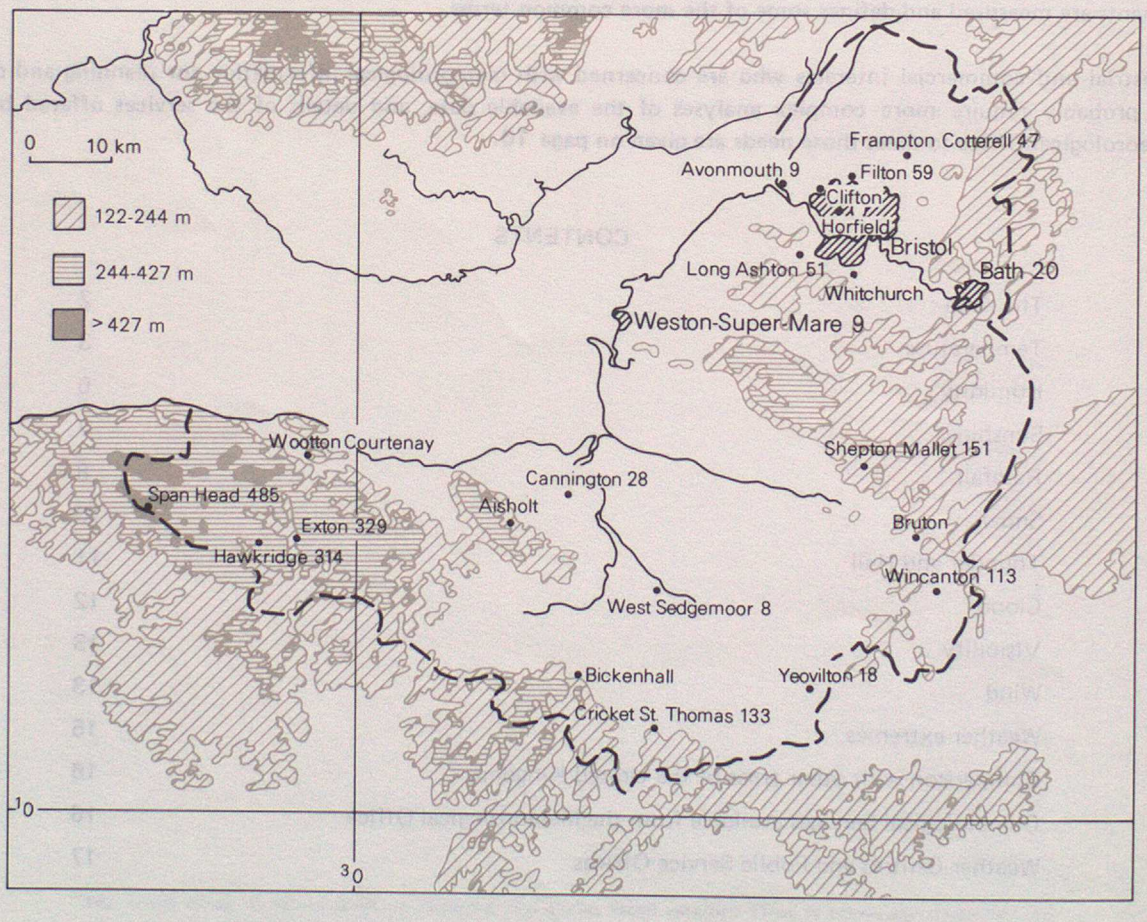
Farming in Somerset and Avon is mainly dairying. Milk is sent to London and other cities and butter, cream and cheese are produced.

Bristol, the main city of the area, is situated at the confluence of the rivers Frome and Avon and dates from Saxon times. Until the 18th century it was the second city and port of England. As ships got larger they were unable to negotiate the River Avon so the ports of Avonmouth, Portishead and Royal Portbury dock were built to accommodate large ships. The industries of Bristol are varied and include aircraft, tobacco, wines and spirits together with public services.

The map below shows the topography of the area and the locations of the rainfall and climatological stations for which data are given in this memorandum.

The number of climatological stations in the area is rather low with, until fairly recently, only one full observing station. Consequently data are presented for fewer stations than is desirable.

Topography of Somerset and Avon and locations and altitudes (in metres) of the stations. Coordinates are National Grid references.



TEMPERATURE

The mean annual temperature over Somerset and Avon is around 10 °C with values slightly higher around the coasts than inland or over hills. Over the British Isles the mean annual temperature ranges from 7 °C in the Shetland Isles to over 11 °C in the extreme south-west of England and the Channel Islands.

Temperature shows both seasonal and diurnal variations. January is on average the coldest month with mean daily minimum temperatures between 1 °C and 2 °C with the lower values occurring inland. This compares with −1 °C in parts of Tayside and Grampian to over 5.5 °C in the Isles of Scilly.

Minimum temperatures normally occur around sunrise and extreme minimum temperatures usually occur in January but have also occurred in December or February. For the locations shown in the map of the area the lowest recorded temperature was −16.1 °C at Yeovilton on 14 January 1982.

Mean daily maximum temperatures are highest in July and in Somerset and Avon are around 20 °C or 21 °C. This compares with the highest mean daily maximum temperatures of 22.5 °C which occur in the London area and the lowest of around 15 °C in the Shetland Isles. Maximum temperatures normally occur 2 to 3 hours after midday and extreme temperatures usually occur in July or August. The highest known temperature recorded in the area was 35.0 °C at Clifton on 12 July 1923.

The variation of mean daily maximum and minimum temperatures recorded at four locations in Somerset and Avon is shown in Figure 1. There is a marked similarity between the curves of mean values but more variation in the extremes which reflect the differing topographical features of the locations as well as the period over which the data have been recorded.

Table 1 gives the average number of days that maximum and minimum temperatures occurred in the ranges specified at Hawkridge and Wincanton. Hawkridge, because of its higher altitude, has fewer days with high temperatures than Wincanton. There is less difference in the occurrences of low temperatures as local topographical features play a more important role.

Frost data for Somerset and Avon are rather limited. Figures show that the average number of days a year of air frost

FIGURE 1 Annual variation of maximum and minimum temperature and extreme temperatures for the periods stated.

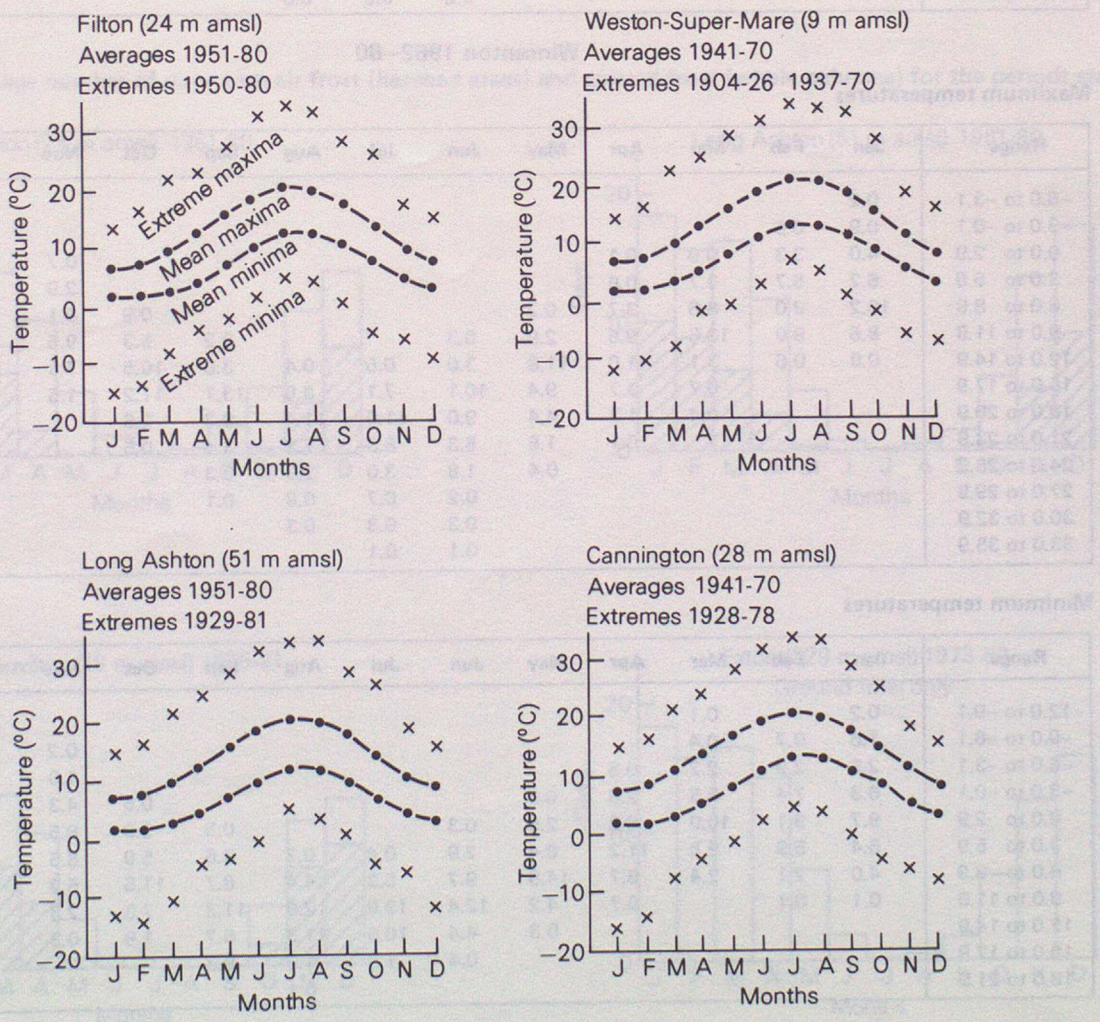


TABLE 1 Average number of days with maximum and minimum temperatures (°C) in the ranges specified for stated periods

Hawkridge 1961–80

Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−6.0 to −3.1	0.5	0.1											0.6
−3.0 to −0.1	1.6	1.7	0.2									0.8	4.3
0.0 to 2.9	5.1	4.7	2.4	0.3							0.8	3.6	16.9
3.0 to 5.9	7.7	7.4	6.6	2.3	0.1					0.1	4.3	6.9	35.4
6.0 to 8.9	12.0	10.8	13.9	8.8	1.1	0.1				2.7	12.1	12.7	74.2
9.0 to 11.9	4.0	3.5	6.4	12.8	11.2	1.9	0.2	0.2	2.2	10.1	9.3	6.4	68.2
12.0 to 14.9	0.1		0.9	3.9	10.2	9.6	5.3	4.2	11.4	12.7	3.5	0.6	62.4
15.0 to 17.9			0.5	1.7	5.7	10.6	12.8	15.5	12.2	4.8			63.8
18.0 to 20.9			0.1	0.2	2.2	4.6	8.2	7.1	3.7	0.5			26.6
21.0 to 23.9					0.4	2.7	3.7	2.9	0.5	0.1			10.3
24.0 to 26.9						0.3	0.7	0.8	0.1				1.9
27.0 to 29.9						0.2	0.2	0.2					0.6

Minimum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−12.0 to −9.1	0.3		0.1									0.1	0.5
−9.0 to −6.1	1.5	0.8	0.3								0.1	0.3	3.0
−6.0 to −3.1	2.7	3.2	1.8	0.4	0.1						0.5	2.3	11.0
−3.0 to −0.1	7.3	7.8	6.9	3.1	0.7					0.2	4.1	6.1	36.2
0.0 to 2.9	10.7	9.0	11.8	10.5	3.3	0.5			0.6	3.2	9.7	10.1	69.4
3.0 to 5.9	6.5	6.2	8.8	10.7	11.6	3.3	0.7	0.9	3.8	7.5	8.6	8.0	76.6
6.0 to 8.9	2.1	1.3	1.3	5.3	13.0	13.9	8.6	6.9	10.6	12.6	5.7	3.9	85.0
9.0 to 11.9	0.1				2.2	10.0	14.8	15.2	11.3	6.5	1.3	0.3	61.7
12.0 to 14.9					0.1	2.0	6.2	7.3	3.7	0.9			20.2
15.0 to 17.9						0.2	0.6	0.6					1.4

Wincanton 1962–80

Maximum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−6.0 to −3.1	0.2												0.2
−3.0 to −0.1	0.9	0.6										0.4	1.9
0.0 to 2.9	4.0	3.3	0.9	0.1							0.7	3.4	12.4
3.0 to 5.9	6.2	5.7	3.7	0.6							2.9	5.3	24.4
6.0 to 8.9	10.2	9.0	8.6	3.7	0.2					0.9	8.1	8.7	49.4
9.0 to 11.9	8.5	9.0	13.6	9.5	2.9	0.3			0.2	5.3	9.5	10.7	69.5
12.0 to 14.9	0.9	0.6	3.1	11.0	11.8	3.0	0.5	0.4	3.6	10.5	7.3	2.4	55.1
15.0 to 17.9			0.7	3.7	9.4	10.1	7.1	8.5	13.1	11.2	1.5	0.1	65.4
18.0 to 20.9			0.4	1.3	4.4	9.0	11.0	11.4	9.3	2.6			49.4
21.0 to 23.9				0.1	1.8	5.3	8.3	7.3	3.4	0.5			26.7
24.0 to 26.9					0.4	1.8	3.0	2.3	0.3				7.9
27.0 to 29.9						0.2	0.7	0.8	0.1				1.9
30.0 to 32.9						0.3	0.3	0.3					0.8
33.0 to 35.9						0.1	0.1						0.2

Minimum temperatures

Range	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
−12.0 to −9.1	0.2		0.1									0.1	0.4
−9.0 to −6.1	1.6	0.7	0.4								0.2	0.6	3.4
−6.0 to −3.1	2.6	2.9	2.2	0.5							1.0	2.9	12.1
−3.0 to −0.1	6.3	7.4	5.5	2.8	0.5					0.5	4.3	6.5	33.8
0.0 to 2.9	9.7	9.1	10.9	8.2	2.9	0.3			0.5	3.9	8.5	8.6	62.6
3.0 to 5.9	6.4	5.9	9.5	11.2	8.4	2.9	0.4	0.7	3.6	5.9	8.3	6.5	69.7
6.0 to 8.9	4.0	2.1	2.4	6.7	14.6	9.7	5.3	4.4	8.7	11.5	5.2	4.5	79.3
9.0 to 11.9	0.1	0.1		0.7	4.2	12.4	12.9	12.9	11.3	7.3	2.3	1.2	65.4
12.0 to 14.9					0.3	4.4	10.6	11.3	5.7	1.8	0.3		34.4
15.0 to 17.9						0.4	1.8	1.6	0.3				4.1
18.0 to 21.9								0.1					0.1

varies from about 35 around coasts to 60 or more inland. For ground frost the values are from 80 to 110 days a year on average. Figure 2 shows the average number of days of air and ground frost for four locations in the area. The summer months are usually free from air frosts though at some sheltered locations a ground frost can occur at any time of the year. See also the Introduction to the series.

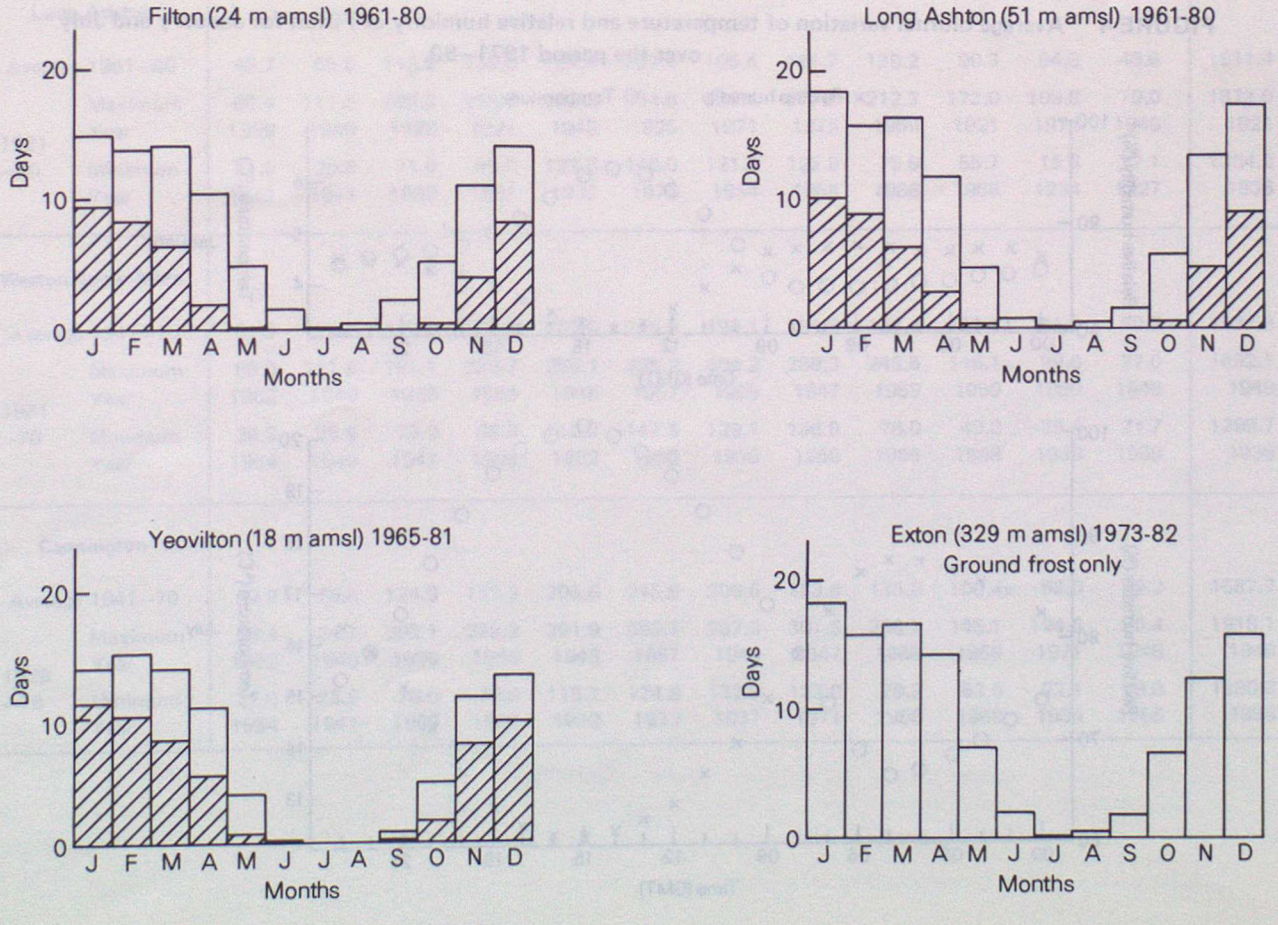
Table 2 gives the average number of days that temperatures exceeded certain limits at four locations in Somerset and Avon during the period 1961–80. The higher altitude of Hawkridge means that it has less occasions of high temperatures than the other three locations. There is less variation in the low temperature occasions as cold air tends to drain away from high ground and collect in valleys and hollows.

TABLE 2 Average number of days (1961–80) with maximum and minimum temperatures exceeding the specified limits

Maximum temperature	25°C or more					30°C or more		
	May	Jun	Jul	Aug	Sep	Jun	Jul	Aug
Filton	0.3	1.7	2.7	2.6	0.3	0.3	0.4	0.3
Hawkridge		0.3	0.4	0.6	0.1			
Long Ashton	0.3	2.1	2.9	2.8	0.3	0.3	0.3	0.3
Wincanton	0.3	1.8	2.5	2.7	0.1	0.3	0.3	0.3

Minimum temperature	−5°C or less						−10°C or less			
	Nov	Dec	Jan	Feb	Mar	Apr	Dec	Jan	Feb	Mar
Filton	0.2	1.7	2.8	1.2	0.6			0.4	0.1	
Hawkridge	0.1	0.9	2.7	1.4	0.6	0.1	0.1	0.1		0.1
Long Ashton	0.1	1.3	2.5	0.9	0.5			0.3		
Wincanton	0.3	1.7	2.7	1.9	0.9	0.1	0.1	0.3		0.1

FIGURE 2 Average number of days with air frost (hatched areas) and ground frost (whole columns) for the periods stated.



HUMIDITY

Relative humidity is a measure of the amount of water vapour in the air compared with the maximum amount which could be contained by the air at the same temperature, expressed as a percentage. If the amount of water vapour in the air remains constant then as the temperature rises (or falls) the relative humidity decreases (or increases).

Relative humidity over Somerset and Avon averages around 85 per cent over the year with higher values occurring in the winter and at night. Relative humidity equals or exceeds 95 per cent for some 20 to 25 per cent of the time, and 100 per cent can be reached in fog and persistent rain, snow or drizzle. Low humidities are less common as Figure 3 shows. This gives the percentage of time relative humidities occurred in the ranges specified at Filton during the period 1971–80. The 11 to 15 per cent range represents just two hours during the ten-year period.

Figure 4 shows the average diurnal variation of relative humidity and temperature at Filton for the months of January and July. This illustrates a number of the points made in the text.

FIGURE 3 Percentage of time relative humidity occurred in the ranges specified at Filton over the period 1971–80.

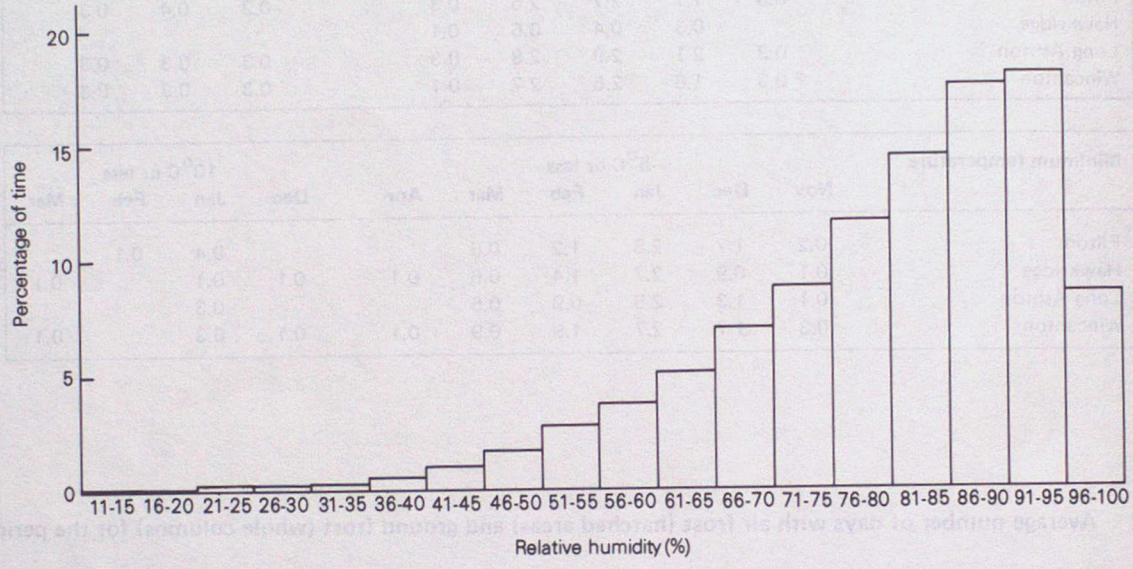
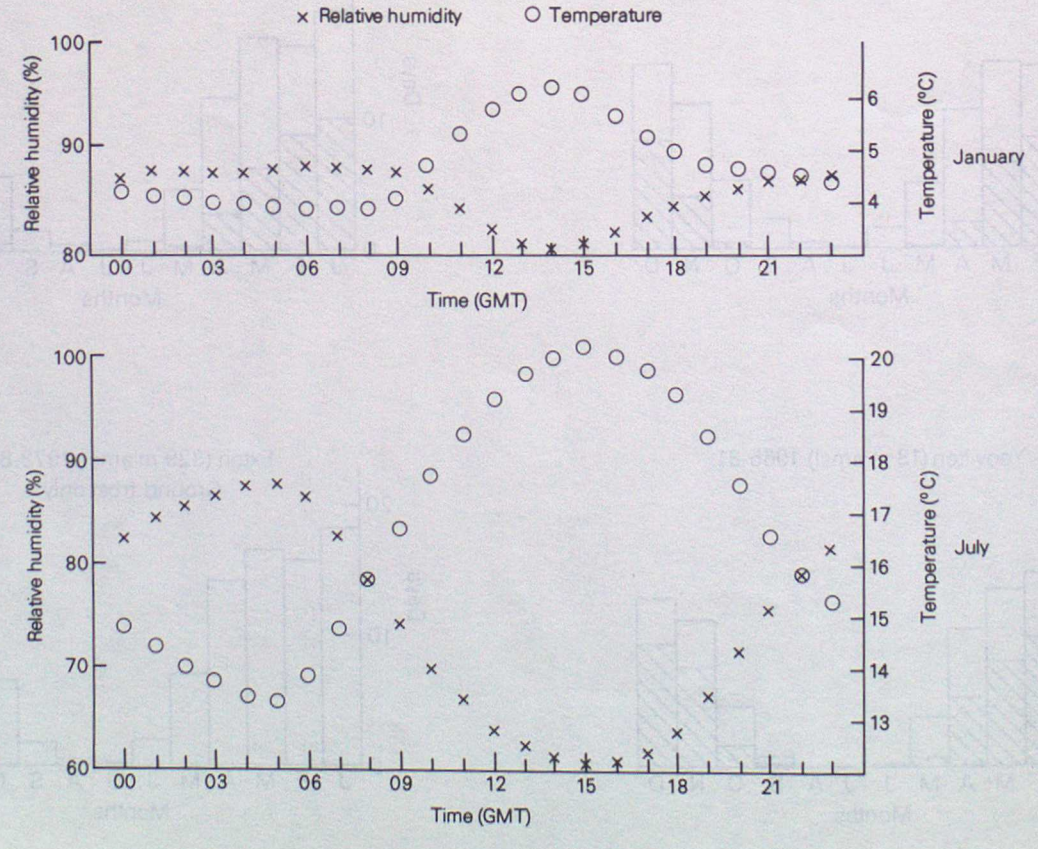


FIGURE 4 Average diurnal variation of temperature and relative humidity at Filton for January and July over the period 1971–80.



SUNSHINE

The variation in length of day throughout the year means that the duration of sunshine shows a marked annual variation. On average December is the month with least sunshine and June the sunniest. In general sunshine durations decrease with increasing altitude and latitude though aspect plays an important role, for example, the difference between north and south facing locations. Industrial pollution and smoke haze can reduce sunshine amounts.

Sunshine data for Somerset and Avon are limited but available data show that average annual sunshine totals vary from around 1450 hours to nearly 1600 hours. The sunniest place in Great Britain is St Helier, Jersey with an annual average over the period 1951–80 of 1928 hours and the least sunniest the Shetland Isles with less than 1100 hours.

Table 3 lists the average monthly and annual sunshine totals recorded at four locations in Somerset and Avon plus extreme values for the periods stated. The lowest monthly total was 13.3 hours at Filton in December 1958. The absolute minimum for Great Britain was at Westminster in December 1890 with no sunshine recorded. The highest monthly total was 334.8 hours at Long Ashton in June 1925 and in the same year the highest June total in Great Britain of 381.7 hours was recorded at Pendennis Castle, Falmouth.

Table 4 gives the average number of days each month in the period 1961–80 that sunshine durations occurred in the ranges specified at Long Ashton and Hawkridge. The differences between the two locations are due almost entirely to the differences in altitude.

TABLE 3 Average monthly and annual totals of duration (hours) of bright sunshine and extreme values for stated periods

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Filton														
Average 1951–80		47.6	62.5	107.4	149.7	190.2	204.3	192.1	174.0	135.0	94.1	62.5	44.9	1464.4
1950–80	Maximum	78.2	96.0	152.9	210.7	252.5	296.0	273.8	264.0	215.2	139.5	111.2	64.1	1718.6
	Year	1979	1970	1955	1954	1971	1957	1955	1976	1959	1971	1971	1965	1959
	Minimum	22.9	31.0	55.7	72.7	135.0	132.2	122.8	124.3	79.7	50.0	38.1	13.3	1250.5
	Year	1964	1966	1964	1961	1969	1964	1965	1968	1951	1968	1953	1958	1963
Long Ashton														
Average 1951–80		48.7	65.8	113.6	155.0	194.4	207.4	195.4	181.7	139.2	99.3	64.3	46.6	1511.4
1921–80	Maximum	80.4	111.5	197.3	218.0	286.3	334.8	277.4	277.5	212.3	173.0	109.8	79.0	1873.0
	Year	1959	1949	1929	1921	1948	1925	1971	1976	1959	1921	1971	1946	1921
	Minimum	21.0	20.8	71.4	85.0	127.6	140.0	121.8	127.8	75.8	55.7	15.8	17.1	1304.2
	Year	1973	1947	1969	1961	1932	1972	1954	1958	1956	1968	1934	1927	1936
Weston-Super-Mare														
Average 1941–70		51.9	74.0	125.0	169.8	202.5	216.5	199.1	184.8	138.4	103.1	61.9	50.8	1577.8
1931–70	Maximum	89.0	111.8	181.1	230.7	286.1	308.2	304.2	288.3	245.5	146.1	89.6	77.0	1892.1
	Year	1952	1949	1933	1954	1948	1957	1955	1947	1959	1959	1960	1946	1949
	Minimum	26.8	28.6	73.2	88.0	112.9	147.5	129.1	136.9	76.0	49.8	36.4	21.7	1299.7
	Year	1964	1940	1947	1966	1932	1936	1936	1958	1956	1968	1939	1958	1936
Cannington														
Average 1941–70		52.6	75.6	124.9	171.3	205.6	215.9	206.6	183.8	135.8	100.4	63.0	52.2	1587.7
1928–78	Maximum	89.4	124.7	202.1	238.2	291.9	308.7	287.2	301.5	236.1	145.1	124.6	80.4	1918.1
	Year	1952	1949	1929	1948	1948	1957	1949	1947	1959	1959	1971	1946	1949
	Minimum	27.0	23.9	76.0	79.9	118.7	124.8	132.9	123.0	79.2	53.5	22.1	19.0	1380.8
	Year	1964	1947	1969	1966	1932	1972	1937	1971	1956	1968	1934	1956	1958

TABLE 4 Average number of days (1961–80) of sunshine duration in the ranges specified

Long Ashton

Duration (Hours per day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Nil	12.6	8.7	5.3	3.9	2.1	1.9	1.7	1.7	2.5	5.8	8.7	12.3	67.2
0.1 to 3.0	11.5	10.0	10.1	7.9	7.3	6.2	7.1	8.2	8.5	11.1	11.3	11.3	110.5
3.1 to 6.0	5.1	6.1	6.2	6.5	6.3	5.3	6.2	6.1	7.3	8.4	6.8	6.2	76.5
6.1 to 9.0	1.8	3.2	7.3	6.3	5.9	5.1	7.1	5.7	7.3	4.9	3.2	1.2	59.1
9.1 to 12.0		0.2	2.1	4.5	5.2	4.9	5.1	6.3	4.2	0.7			33.3
12.1 or more				0.9	4.1	6.5	3.9	2.9	0.1				18.4

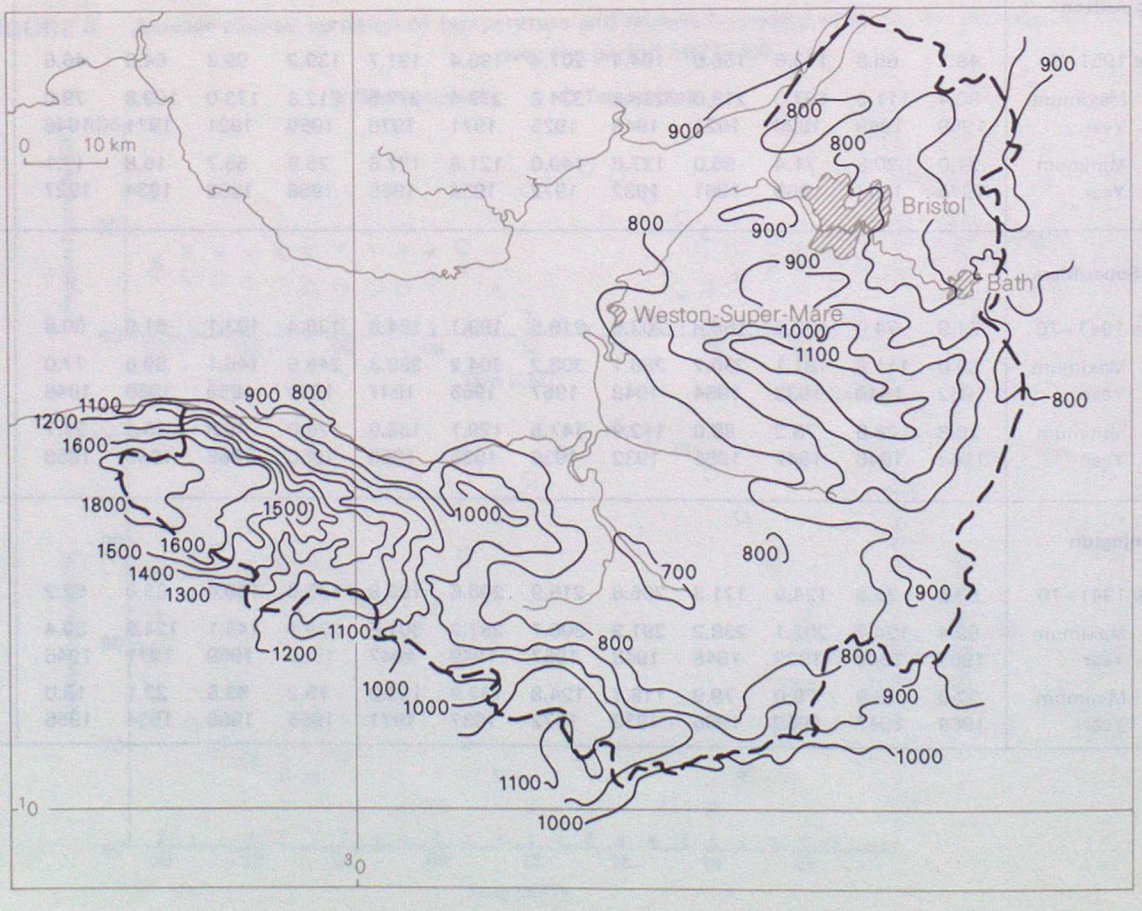
Hawkridge

Duration (Hours per day)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Nil	13.5	9.3	7.1	3.6	2.7	2.3	2.3	2.1	2.9	6.0	8.9	13.7	74.5
0.1 to 3.0	11.9	10.8	9.7	8.1	8.5	8.3	8.9	9.1	10.4	12.7	11.2	11.4	121.1
3.1 to 6.0	4.0	4.6	6.3	6.3	6.5	5.4	5.2	6.7	7.3	7.2	6.6	4.1	70.3
6.1 to 9.0	1.6	3.3	4.8	6.9	4.6	4.8	6.0	5.8	5.0	4.5	3.3	1.8	52.3
9.1 to 12.0		0.1	3.0	4.2	4.6	3.8	4.4	5.4	4.3	0.6			30.4
12.1 or more				0.8	4.1	5.3	4.1	1.9	0.1				16.3

RAINFALL

The distribution of rainfall over the United Kingdom is very much influenced by topography with the largest values occurring over the more mountainous regions and the smallest values in the lower lying areas. In this text rainfall also includes snow, sleet and hail as well as the small amounts from dew, hoar frost and rime. The map shows the annual average rainfall over Somerset and Avon; the influence of topography is clearly seen.

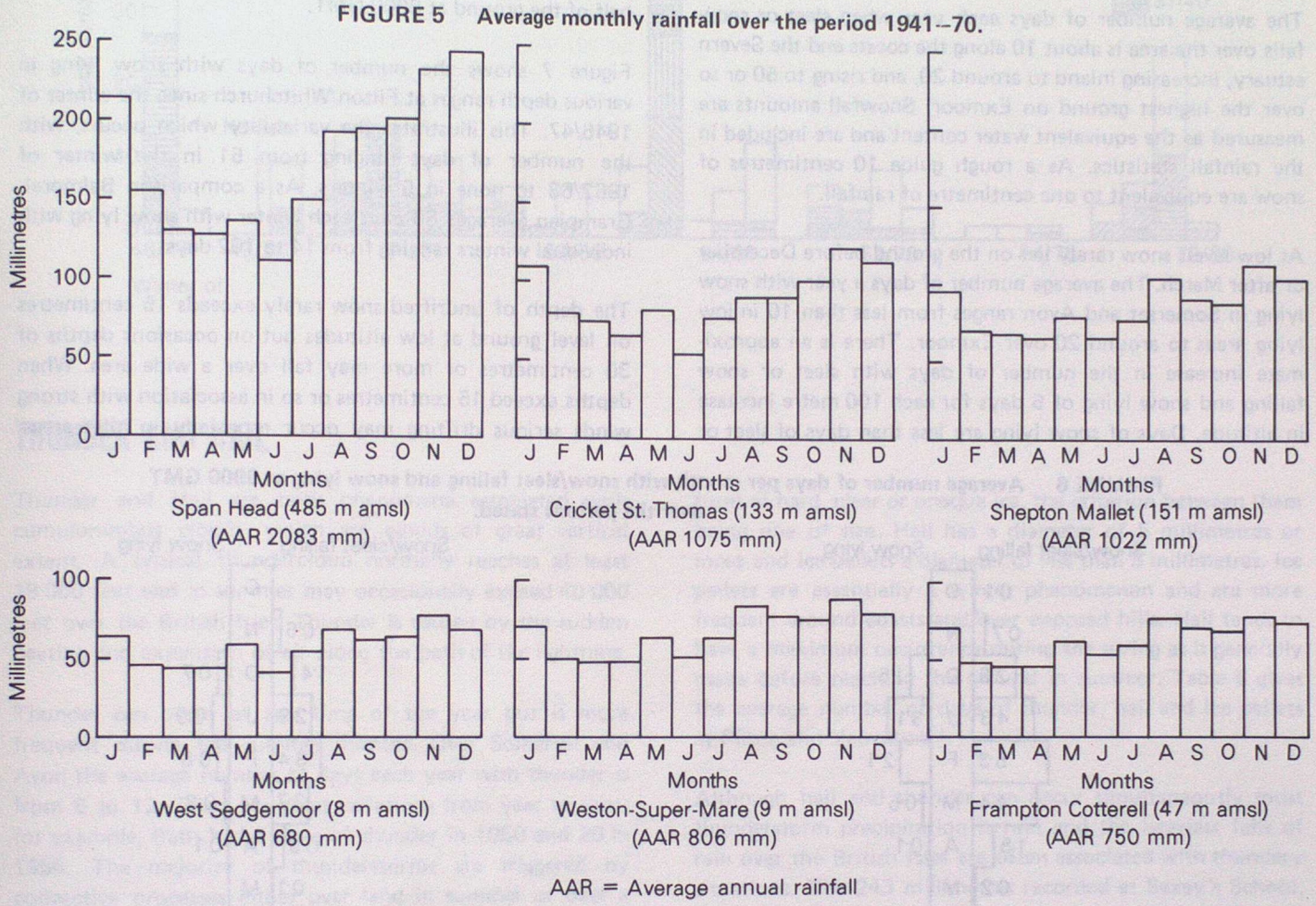
Average annual rainfall (mm) over the period 1941–70. Coordinates are National Grid references.



The nature of rainfall varies during the year. In summer rainfall is often of a showery nature falling over short periods and is normally more intense than winter rainfall which tends to be more frontal in character with falls occurring over longer periods. As a rough guide an average day of steady rain gives 10 to 15 millimetres and a heavy thunderstorm lasting an hour or so 25 to 50 millimetres. 25 millimetres of rainfall is equivalent to about 200 tonnes of water on a football pitch.

Figure 5 shows the monthly variation of rainfall for six locations in Somerset and Avon. Although the individual totals show a wide variation the pattern of rainfall throughout the year is similar with the period February to April the driest and November to January the wettest. There is a secondary peak in August when showery activity usually reaches a maximum. The general increase in rainfall with altitude is apparent. Rainfall is extremely variable as the data in Table 5 show.

FIGURE 5 Average monthly rainfall over the period 1941–70.



AAR = Average annual rainfall

TABLE 5 Average annual and monthly rainfall (mm) over the period 1951–80, with maximum fall in 24 hours and extreme values for stated periods

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Long Ashton													
Average	83	61	60	52	62	62	66	86	85	74	91	87	869
1920 Wettest	163.4	180.8	162.3	123.2	150.7	158.2	201.4	202.9	200.2	222.7	251.9	211.7	1247.2
–82 Driest	17.3	1.5	4.2	3.6	12.7	0.8	3.8	4.9	4.9	3.8	13.6	13.7	633.7
Maximum fall in 24 hours	45.5	34.8	28.8	33.1	35.4	57.1	129.5	82.3	46.0	58.9	59.7	48.5	
Filton													
Average	73	54	54	48	58	60	57	77	74	62	78	80	775
1951 Wettest	135.9	130.9	119.4	113.5	150.0	139.7	130.6	135.0	179.0	184.2	165.1	200.0	985.8
–80 Driest	13.1	2.6	1.5	1.8	11.6	8.7	2.7	25.3	4.4	4.8	19.0	22.3	578.1
Maximum fall in 24 hours	32.9	31.8	24.9	31.5	41.3	56.4	92.0	45.2	44.9	36.2	55.8	41.3	

SNOW

The occurrence of snow is linked closely with temperature with falls rarely occurring in association with temperatures higher than 4 °C. Over Somerset and Avon falls of sleet or snow are normally confined to the months October to May though over low ground falls are relatively few in October and May.

The average number of days each year when sleet or snow falls over the area is about 10 along the coasts and the Severn estuary, increasing inland to around 20, and rising to 50 or so over the highest ground on Exmoor. Snowfall amounts are measured as the equivalent water content and are included in the rainfall statistics. As a rough guide 10 centimetres of snow are equivalent to one centimetre of rainfall.

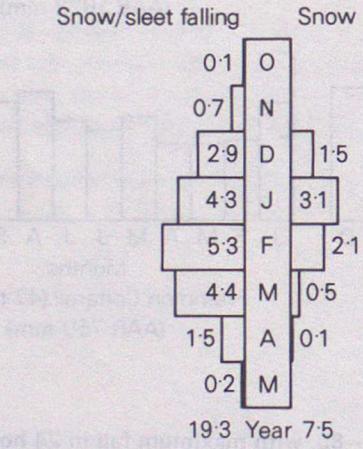
At low levels snow rarely lies on the ground before December or after March. The average number of days a year with snow lying in Somerset and Avon ranges from less than 10 in low lying areas to around 20 over Exmoor. There is an approximate increase in the number of days with sleet or snow falling and snow lying of 5 days for each 100 metre increase in altitude. Days of snow lying are less than days of sleet or snow falling because in many cases when snow is falling the temperature of the air and the ground remain above freezing with the result that the snow never lies at all.

Figure 6 shows the average number of days of sleet or snow falling and snow lying at four locations in the area. A day of snow lying is defined as one with snow covering at least one half of the ground at 0900 GMT.

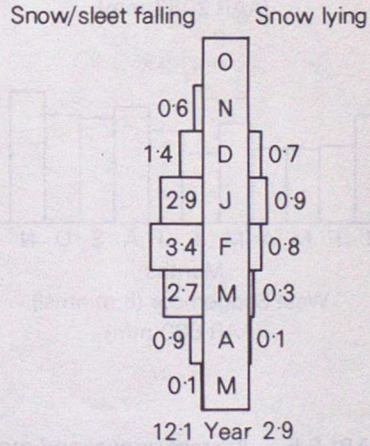
Figure 7 shows the number of days with snow lying in various depth ranges at Filton/Whitchurch since the winter of 1946/47. This illustrates the variability which occurs, with the number of days ranging from 51 in the winter of 1962/63 to none in 5 winters. As a comparison Balmoral, Grampian averages 60 days each winter with snow lying with individual winters ranging from 14 to 102 days.

The depth of undrifted snow rarely exceeds 15 centimetres on level ground at low altitudes but on occasions depths of 30 centimetres or more may fall over a wide area. When depths exceed 15 centimetres or so in association with strong winds serious drifting may occur especially in hilly areas.

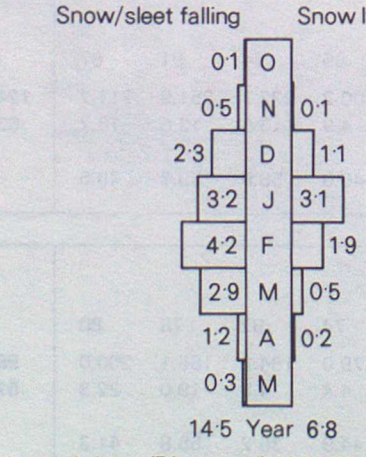
FIGURE 6 Average number of days per month with snow/sleet falling and snow lying at 0900 GMT over the periods stated.



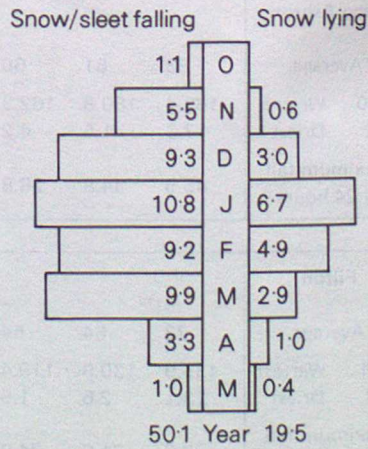
Filton (24 m amsl) 1961-80



Yeovilton (18 m amsl) 1965-80

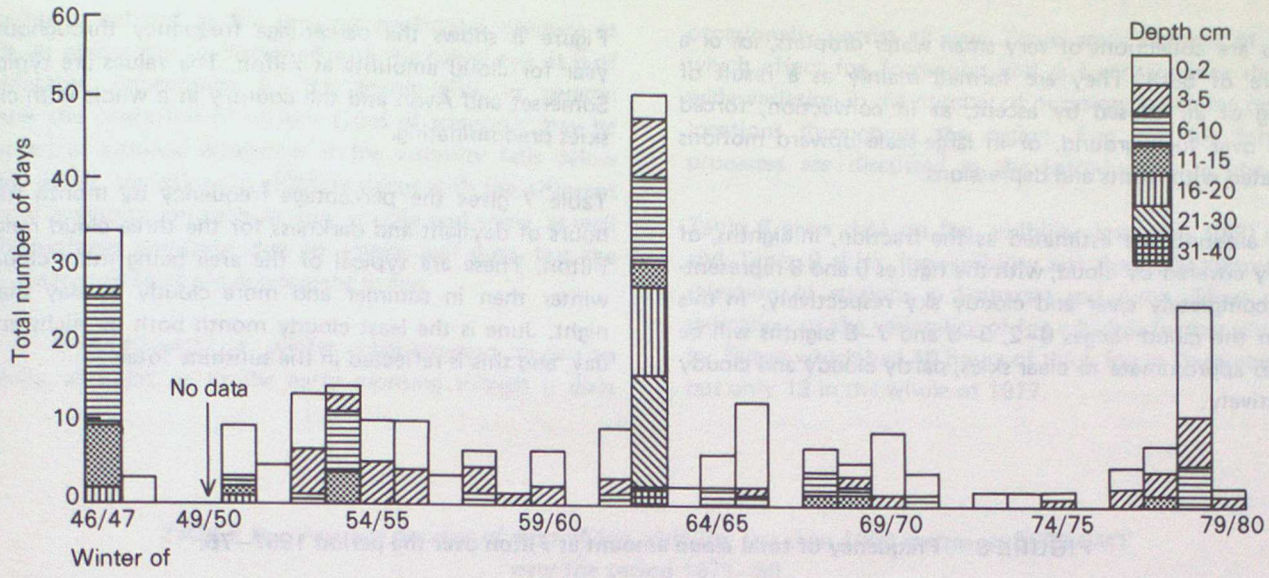


Long Ashton (51 m amsl) 1961-80



Exton (329 m amsl) 1973-82

FIGURE 7 Number of days with total snow depth at 0900 GMT in stated ranges at Filton/Whitchurch.



THUNDER AND HAIL

Thunder and Hail are both phenomena associated with cumulonimbus clouds, which are clouds of great vertical extent. A typical thundercloud normally reaches at least 18 000 feet and in summer may occasionally exceed 40 000 feet over the British Isles. Thunder is caused by the sudden heating and expansion of air along the path of the lightning.

Thunder can occur at any time of the year but is more frequent during the summer months. Over Somerset and Avon the average number of days each year with thunder is from 6 to 12. There are great variations from year to year; for example, Bath had 5 days of thunder in 1950 and 20 in 1959. The majority of thunderstorms are triggered by convective processes either over land in summer or over a comparatively warm sea in winter.

In thunderstorms or heavy showers at any time of year the precipitation may be of hail or ice pellets. Both are in the form of hard, clear or opaque ice, the criterion between them being one of size. Hail has a diameter of 5 millimetres or more and ice pellets a diameter of less than 5 millimetres. Ice pellets are essentially a winter phenomenon and are more frequent around coasts and over exposed hills. Hail tends to have a maximum occurrence during the spring as it generally melts before reaching the ground in summer. Table 6 gives the average number of days of thunder, hail and ice pellets at Filton and Yeovilton.

Although hail and thunder can occur simultaneously most thunderstorm precipitation is rain and the heaviest falls of rain over the British Isles are often associated with thundery situations. The 243 millimetres recorded at Sexey's School, Bruton on 28 June 1917 was associated with a thundery situation and is one of the largest falls recorded in 24 hours in the British Isles.

TABLE 6 Average number of days of thunder, hail and ice pellets for stated periods

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Filton 1957–80													
Thunder	0.3	0.3	0.2	0.6	1.8	2.0	1.8	2.0	0.8	0.5	0.6	0.4	11.3
Hail	0.4	0.7	1.3	1.0	0.9	0.2		0.1	0.1	0.2	0.4	0.7	6.0
Ice Pellets	0.8	0.8	0.5	0.2	0.1	0.1				0.1	0.3	0.6	3.7
Yeovilton 1965–81													
Thunder	0.4	0.1	0.4	0.2	1.0	1.4	1.6	1.8	0.6	0.2	0.3	0.4	8.5
Hail	0.3	0.8	0.9	0.8	0.6	0.1	0.1		0.1	0.1	0.4	0.4	4.5
Ice Pellets	0.2	0.4	0.2	0.1	0.1	0.1				0.1	0.1	0.5	1.8

CLOUD

Clouds are collections of very small water droplets, ice or a mixture of both. They are formed mainly as a result of cooling of air caused by ascent, as in convection, forced lifting over high ground, or in large-scale upward motions associated with fronts and depressions.

Cloud amounts are estimated as the fraction, in eighths, of the sky covered by cloud, with the figures 0 and 8 representing a completely clear and cloudy sky respectively. In this section the cloud ranges 0–2, 3–6 and 7–8 eighths will be used to approximate to clear skies, partly cloudy and cloudy respectively.

Figure 8 shows the percentage frequency throughout the year for cloud amounts at Filton. The values are typical of Somerset and Avon and the country as a whole with cloudy skies predominating.

Table 7 gives the percentage frequency by month for the hours of daylight and darkness for the three cloud ranges at Filton. These are typical of the area being more cloudy in winter than in summer and more cloudy by day than by night. June is the least cloudy month both by night and by day, and this is reflected in the sunshine totals.

FIGURE 8 Frequency of total cloud amount at Filton over the period 1957–76.

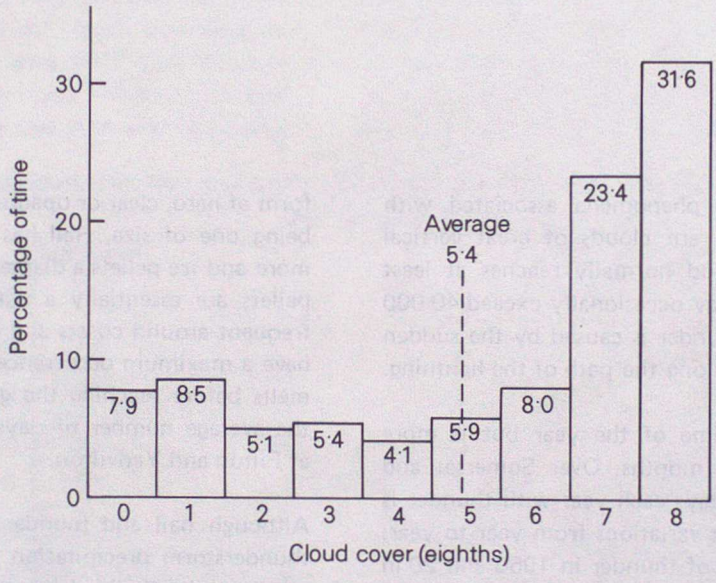


TABLE 7 Percentage frequency of hours with total cloud amount in selected ranges at Filton over the period 1957–76

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Eighths						**Daylight hours**							
0–2	12.5	11.7	15.6	15.3	16.1	21.0	15.4	17.5	17.1	13.2	15.4	15.3	15.9
3–6	17.2	19.5	25.7	28.7	31.3	31.8	31.7	31.6	30.5	25.6	22.0	19.0	27.3
7–8	70.3	68.7	58.7	56.1	52.7	47.3	53.0	51.0	52.3	61.3	62.7	65.7	56.8
						Hours of darkness							
0–2	20.1	23.5	29.0	32.5	29.3	33.0	28.1	33.0	34.7	26.4	24.6	23.2	27.2
3–6	14.1	15.5	17.3	20.2	25.0	23.3	26.4	25.7	21.5	19.8	19.0	14.6	19.5
7–8	65.7	61.1	53.7	47.4	45.6	43.7	45.4	41.4	43.7	53.8	56.4	62.2	53.4

VISIBILITY

Visibility is defined as the greatest horizontal distance at which an object can be discerned with the naked eye. It is of considerable importance to the community in general because the operation of various types of transport may be disrupted or stopped altogether if the visibility falls below certain limits. Variations in visibility occur with the different types of precipitation such as rain, drizzle and snow, as well as atmospheric pollution due to smoke and dust, but the really poor visibilities are due mainly to fog.

Fog is predominantly a winter phenomenon occurring generally at night or in the early morning though it does occasionally persist all day. There are a number of factors which affect fog formation and as a consequence there is a wide variation in the number of occasions when fog occurs at locations throughout the region. Fog and fog formation processes are discussed in the Introduction to the series.

Table 8 gives data on fog, visibility less than 1000 metres, and Table 9 thick fog, visibility less than 200 metres, for a selection of stations in Somerset and Avon. These give an indication of the variability of fog which is further illustrated by Filton which had 48 hours of thick fog in December 1976 but only 13 in the whole of 1977.

TABLE 8 Average number of days of fog, visibility less than 1000 metres, at 0900 GMT over the period 1971–80

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Hawkridge	3.9	5.4	3.3	2.0	0.9	1.4	1.1	1.5	1.3	2.4	3.6	3.6	30.4
Rodney Stoke	2.1	2.9	0.9	0.5	0.8	0.3	0.3	0.7	0.7	2.3	1.2	1.5	14.2
Wincanton	4.8	6.0	2.3	0.9	0.8	0.2	0.9	0.8	1.6	5.1	3.5	4.7	31.6
Birds Hill	2.2	3.9	1.8	1.6	1.0	1.0	0.6	0.9	0.5	3.1	0.5	1.9	19.0
Nettlecombe	1.0	1.6	0.8	0.6	0.6	0.4	0.3	0.7	0.3	1.7	0.2	1.0	9.2
Downside Abbey	4.4	4.3	1.4	0.6	0.8	0.6	0.3	0.7	1.4	4.0	1.7	2.9	23.1

TABLE 9 Average and maximum numbers of hours of thick fog, visibility less than 200 metres, for stated periods

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Filton 1971–80													
Average	8.4	7.0	2.3	0.7	1.0	0.1	0.3	0.3	1.1	7.9	5.8	10.0	44.9
Maximum	29	27	12	3	3	1	2	1	9	19	19	48	78
Yeovilton 1977–82													
Average	22.7	10.2	2.7	6.5	4.7	2.2	1.8	4.7	7.5	8.7	10.7	6.3	88.5
Maximum	59	31	7	18	12	8	10	13	25	35	27	19	120

WIND

The wind direction is that from which the wind blows recorded either as a compass point or degrees from true north. Wind speeds are measured in knots (1 knot = 1.15 mph. 1 metre per second = 1.94 knots) and are closely related to the pressure distribution. The strongest winds are associated with the passage of deep depressions across or close to the United Kingdom. The frequency of depressions is greatest during the winter months so this is when the strongest winds normally occur.

Wind seldom occurs as a smooth flowing airstream and eddies give variations both in direction and speed. Winds are usually stronger by day due to increased turbulence caused by temperature rise making average speeds higher and the wind more gusty.

A day of gale is defined as a day on which the wind speed attains a mean value of 34 knots or more over any period of ten consecutive minutes. In Somerset and Avon the number of days of gale a year is generally 3 days or less though in the more western parts of the area this figure rises to between 5 and 10 days.

Table 10 gives the annual percentage frequency of hourly mean wind speeds and directions for Avonmouth for the period 1970–80. These data are typical of the area with south-westerly winds predominating.

The wind roses for Avonmouth illustrate how the wind varies throughout the year. The high incidence of north-easterly winds in April is due to the weather patterns which predominate during this month.

TABLE 10 Annual percentage frequencies of hourly mean wind speed and direction for Avonmouth over the period 1970–80

Knots	Beaufort force equivalent	30° sectors centred on 360°	030°	060°	090°	120°	150°	180°	210°	240°	270°	300°	330°	All directions
Calm	0													1.2
1–3	1	0.5	0.6	1.1	0.9	0.8	1.1	1.3	0.8	0.4	0.5	0.5	0.5	12.1
4–10	2–3	2.6	4.4	6.8	2.1	2.7	2.5	2.4	5.6	3.5	3.6	1.8	1.7	41.1
11–21	4–5	2.0	4.0	1.8	0.3	0.8	1.2	3.0	5.7	8.4	7.5	2.0	1.6	39.1
22–33	6–7	0.1	0.1	+	+	+	0.1	0.5	0.5	1.1	1.1	0.2	0.1	3.9
⩾34	⩾8							+	+	+	+	+		0.1
⩾4	⩾2	4.6	8.4	8.6	2.4	3.5	3.7	5.9	11.7	13.1	12.1	4.1	3.4	84.2
												Missing data		2.5

+ = Observations recorded in these categories but for less than 0.05 per cent of the time

FIGURE 9 Wind roses for Avonmouth over the period 1970–80.

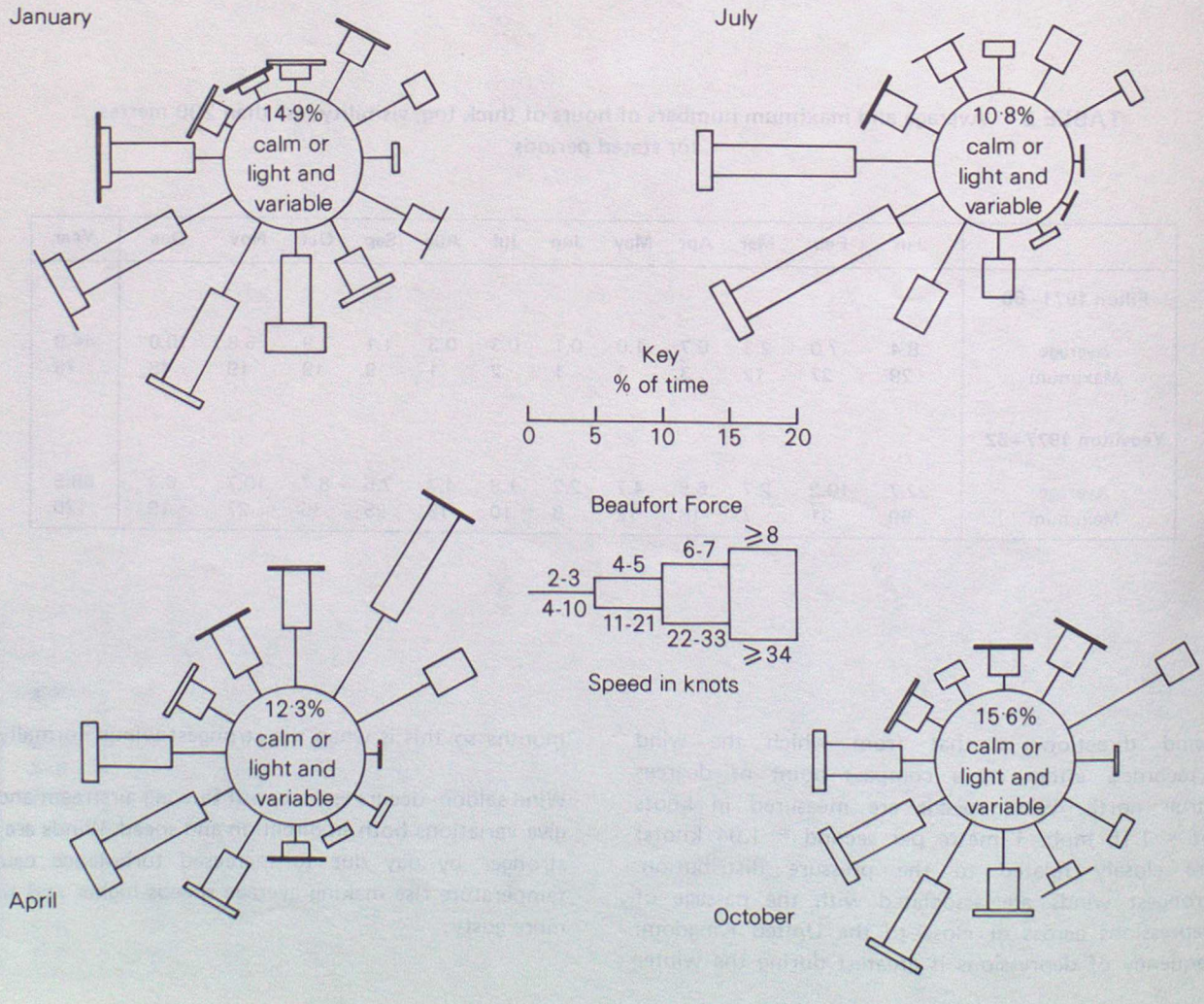


TABLE 11 Weather extremes

TEMPERATURE	Date records began and ceased where stated	Maximum daily temperature (°C)	Date	Minimum daily temperature (°C)	Date
Somerset and Avon					
Clifton	1901[1]	35.0	12 July 1923	−9.4	8 February 1917
Bristol (Horfield)	1931[2]	34.4	19 August 1932	−13.3	21 January 1940
Yeovilton	1964[3]	34.2	2 July 1976	−16.1	14 January 1982
Cannington	1928[4]	34.0	2 July 1976	−15.6	29 January 1945
Filton	1950[4]	33.8	2 July 1976	−14.5	1 January 1962
Long Ashton	1920	33.9	12 July 1923 19 August 1932	−14.4	25 February 1947
United Kingdom					
Raunds Epsom Canterbury	–	36.7	9 August 1911		
Braemar	–			−27.2	11 February 1895 10 January 1982

SUNSHINE	Date records began and ceased where stated	Maximum monthly duration (hours)	Date	Minimum monthly duration (hours)	Date
Somerset and Avon					
Long Ashton	1921[5]	334.8	June 1925	17.1	December 1927
Wootton Courtenay	1952[6]	319.4	June 1957	27.6	December 1956
Bickenhall	1954[6]	309.5	June 1957	31.5	December 1956
Filton	1950[4]	296.0	June 1957	13.3	December 1958
Hawkridge	1964	291.9	July 1971	18.1	January 1973
United Kingdom					
Eastbourne	–	383.9	July 1911		
London (Westminster)	–			0	December 1890

WIND	Date records began and ceased where stated	Maximum mean wind speed (knots)	Date	Maximum gust speed (knots)	Date
Somerset and Avon					
Avonmouth	1953	45	11 January 1962	73	11 January 1962 18 November 1963
Yeovilton	1977	40	1 February 1978 27 December 1979	67	14 November 1977
Long Ashton	1948[7]	29	9 February 1949	73	11 January 1962
United Kingdom (Low-level sites)					
Shoreham-by-Sea	–	72	16 October 1987		
Kirkwall (Orkney)	–			118	7 February 1969

RAINFALL	Date records began and ceased where stated	Maximum daily fall (mm)	Date
Somerset and Avon			
Bruton (Sexey's School)	–	243	28 June 1917
Cannington (Brymore House)	–	239	18 August 1924
Bruton (King's School)	–	215	28 June 1917
Aisholt (Timbercombe)	–	213	28 June 1917
United Kingdom			
Martinstown (Dorset)	–	279	18 July 1955

Records ceased: [1], 1927; [2], 1940; [3], 1978; [4], 1980; [5], 1957; [6], 1959; [7], 1965.

TABLE 12 Climatological data for places in the United Kingdom based on the period 1941–70 except where indicated

	Altitude (metres)	Average annual rainfall (mm)	Average daily temperatures (°C) # Minimum Jan.	Minimum July	Maximum Jan.	Maximum July	Average annual duration of bright sunshine (hours)	Average annual no. of days with* Air frost	Snow lying
England									
Abingdon (Oxfordshire)	69	605	0.3	11.6	6.3	21.6	1544	57	13
Acklington (Northumberland)	42	644	0.0	10.3	5.5	17.9	1429	60	20
Birmingham Airport (W. Midlands)	96	679	0.1	11.2	5.7	20.5	1385	62	15
London (Kensington Palace)	25	640	1.7	13.3	6.6	22.2	1384[x]	35	7
Manchester Airport (Gr. Manchester)	75	819	0.5	11.7	5.8	19.6	1334	47	10
Plymouth/Mount Batten (Devon)	27	990	3.1	12.7	8.3	19.0	1678	25	3
Shawbury (Shropshire)	72	670	0.0	11.2	6.0	20.2	1368	63	17
Southsea (Hampshire)	2	702	2.4	13.9	7.1	20.7	1748	25	6
Waddington (Lincolnshire)	68	598	0.1	11.6	5.2	20.3	1503	54	18
Wales									
Cardiff/Wales Airport (S. Glamorgan)	67	947	1.3	11.9	6.6	19.3	1571	36	8
Valley (Gwynedd)	10	871	2.5	12.0	7.5	18.1	1612	27	3
Northern Ireland									
Belfast Airport (Antrim)	68	912	0.6	10.7	6.1	18.1	1281	53	9
Scotland									
Aberdeen Airport (Grampian)	58	872	−0.9	9.6	5.0	17.5	1341	75	30
Balmoral (Grampian)	283	834	−2.8	8.1	3.7	17.4	1120[†]	116	63
Edinburgh Airport (Lothian)	35	677	−0.6	10.3	5.7	18.5	1294	66	14
Lerwick (Shetland)	82	1172	0.6	9.3	5.0	14.0	1067	53	32
Stornoway (Western Isles)	3	1094	1.3	10.1	6.4	15.7	1244	49	11
Glasgow Airport (Strathclyde)	5	991	0.1	10.8	5.8	18.6	1266	58	6

* Based on 1956–70 only.

[x] For Regents Park.

[†] For Braemar.

\# Referring to 24-hour (09–09 GMT) extremes. Adjustments have been made to those stations normally recording night minimum (21–09 GMT) and day maximum (09–21 GMT). See Introduction to the series.

CLIMATOLOGICAL SERVICES AVAILABLE FROM THE METEOROLOGICAL OFFICE

The Meteorological Office collects and archives regular weather reports from a national network of observing stations, consisting of both Meteorological Offices manned by professional staff and co-operating stations operated by interested organizations or individuals. All these data are subjected to close scrutiny before being archived, to ensure consistency of standards, and are then available to meet the needs of the community.

Any undertaking which is at all weather-sensitive can benefit from a prior knowledge of the climate within which it is expected to operate. The building industry can use past weather statistics to estimate likely delays on contracts, architects and civil engineers need to know the likely extremes of weather which a design must withstand, and many industrial processes are dependent on atmospheric conditions for their success. The agricultural industry uses such information for a variety of purposes, many relating to the viability of new crops and the weather-related incidence and spread of pests and diseases.

In addition to special analyses of weather data for these purposes, the Meteorological Office can supply factual statements on weather conditions for legal or insurance purposes.

Enquiries related to aspects of past weather data should be directed to the appropriate address given on back cover or, if more convenient, initially to your local weather centre (see page 17). Charges for the supply of information depend mainly on the staff time taken to meet the request.

Further information

Information leaflets and brochures describing in more detail the range of specialized services available from the Meteorological Office are available free from the same addresses. These leaflets and brochures also indicate the range of complex analyses that the Meteorological Office can undertake.

Forecasting services

For the day-to-day planning of outdoor work, special weather forecasts and warnings can be arranged to cover specific weather elements at agreed sites. Details may be obtained from:

The Director-General
Meteorological Office (Met O 7)
London Road
Bracknell
Berkshire RG12 2SZ

or from your local weather centre.

WEATHER CENTRES AND PUBLIC SERVICE OFFICES

Weather Centres

Aberdeen
Seaforth Centre
Lime Street
Aberdeen AB2 1BJ

Aberdeen (0224) 210571

Bristol
The Gaunts House
Denmark Street
Bristol BS1 5DH

Bristol (0272) 279272

Cardiff
Southgate House
Wood Street
Cardiff CF1 1EW

Cardiff (0222) 390420

Glasgow
33 Bothwell Street
Glasgow G2 6TS

041—248 7272

Leeds
Oak House
Park Lane
Leeds LS3 1EL

Leeds (0532) 457753

London
284–286 High Holborn
London WC1V 7HX

01—430 5627

Manchester
Applicon House
Exchange Street
Stockport SK3 0ER

061—477 0130

Newcastle
7th Floor
Newgate House
Newgate Street
Newcastle-upon-Tyne NE1 5UQ

Tyneside 091—232 3808

Norwich
Rouen House
Rouen Road
Norwich NR1 1RB

Norwich (0603) 630164

Nottingham
Main Road
Watnall
Nottingham NG16 1HT

Nottingham (0602) 384094

Plymouth
Royal Air Force Mount Batten
Plymouth
Devon PL9 9SH

Plymouth (0752) 493377

Southampton
160 High Street-below-bar
Southampton SO1 0BT

Southampton (0703) 220646

Public Service Offices

Meteorological offices at:

Belfast International Airport
Belfast
Northern Ireland BT29 4AB

Crumlin (084 94) 22804

Birmingham Airport
Birmingham B26 3QN

021—782 6240

Kirkwall Airport
Kirkwall
Orkney KW15 1TH

Kirkwall (0856) 3802

Sella Ness
Port Admin Area
Craven, Mossbank
Shetland ZE2 9QR

(0806) 242060

THE CLIMATE OF GREAT BRITAIN

This memorandum is one of a series which will cover the whole of Great Britain in due course, published in the Climatological Memoranda range. The Introduction (CM 113) to the series explains how various weather elements are measured. The areas to be covered are:

SCOTLAND

114 Borders Region
115 Edinburgh, Lothian Region and Stirling
116 Fife, Dundee and Perth
117 Aberdeen and Buchan
118 Moray Firth coastal Region
119 Northern Isles
120 Western Isles
121 Skye and the North-west
122 Argyll and the Inner Hebrides
123 The Grampians and Perthshire Highlands
124 Glasgow and the Clyde valley
125 Ayrshire and the Firth of Clyde
126 Dumfries and Galloway Region

ENGLAND

127 North-east England
128 Pennines and Lake District
129 East Yorkshire and North Humberside
130 Lancashire and Cheshire and Isle of Man
131 Trent Valley
132 Midlands
133 East Anglia and Lincolnshire
134 Thames Valley
135 London
136 South-east England
137 South England
138 Somerset and Avon
139 South-west Peninsula and Channel Islands

WALES

140 South Wales
141 Mid Wales
142 North Wales and Anglesey

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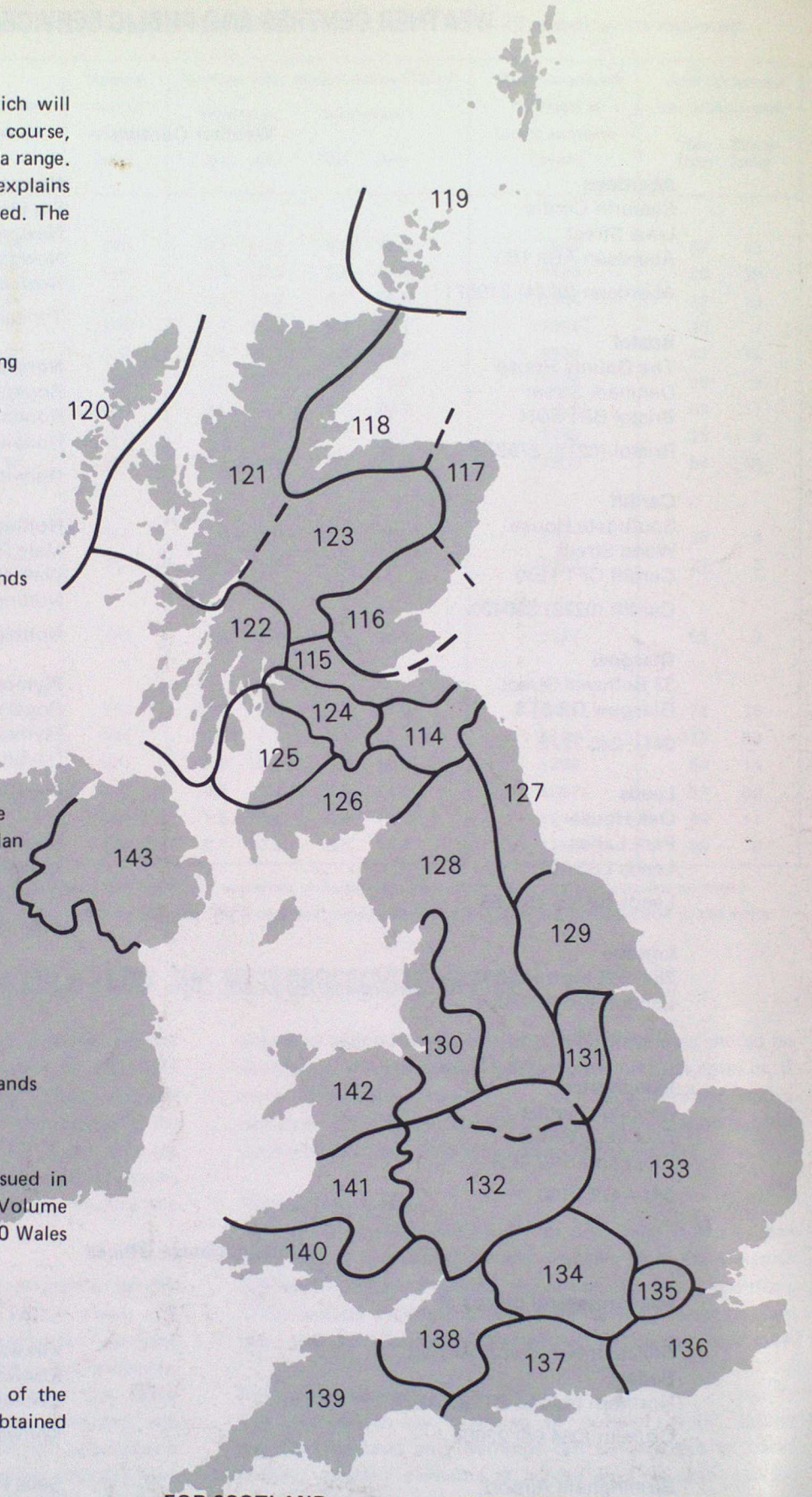
Also available
143 The Climate of Northern Ireland



Further details of these memoranda and of the services mentioned on page 16 can be obtained from:

FOR ENGLAND AND WALES

The Director-General
Meteorological Office (Met O 3b)
London Road
Bracknell
Berkshire RG12 2SZ

FOR SCOTLAND

The Superintendent
Meteorological Office
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Edinburgh EH12 7BB

FOR NORTHERN IRELAND

The Senior Meteorological Officer
Meteorological Office
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1 College Square East
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